

High-order compact schemes for parabolic problems with mixed derivatives in multiple space dimensions with application to basket options

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In this work we present a high-order compact finite difference approach for a class of parabolic partial differential equations with time and space dependent coefficients as well as with mixed second-order derivative terms in n spatial dimensions. We derive general conditions on the coefficients which allow us to obtain a high-order compact scheme which is fourth-order accurate in space and second-order accurate in time. As an application example we consider the pricing of European Power Put Options in the multidimensional Black-Scholes model for two and three underlying assets. Due to the low regularity of typical initial conditions we employ the smoothing operators of Kreiss et al. to ensure high-order convergence of the approximations of the smoothed problem to the true solution.